Tornado Generation Induced by Electrostatic Proximity Effect

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Specific geophysical features such as oil and gas deposits may interact atmospheric environment. A deposit of petroleum seems to induce localized severe meteorological phenomena, such as tornado. Probability and statistic massive data reduction are demonstrated by employing continental U.S. proven oil and gas deposit distribution provided by DOE1 and 40000+ tornado occurrence recorded by NOAA2 over decades, to find that (1) tornado occurrence is not randomly distributed over the ground surface and is rather location-specific and (2) tornado occurrence may significantly be attributed to petroleum deposits. Finally, a geological fuel cell model is presented that the formation of tornadoes is provided by redox reaction in ground and by electrical polarization in atmosphere.

1. Identification and Significance of the Geology-Atmosphere Interaction Concept
The occurrence of severe weather phenomena, such as tornadoes, has been considered an atmospheric event and never been considered a geology-induced phenomena. This study proposes a concept that tornadoes are partially geology-born events in conjunction with certain weather conditions such as thunderstorm passages.

2. Tornado as a Meteorological Phenomena
There are approximately one thousand annual incident of tornadoes in the United States, mostly associated with thunderstorms. In the United States, the occurrence of these severe weather phenomena is most concentrated in the South to the Midwest, where the production of oil and gas are significant. The discharge of the charged electrons in the storm clouds may be carried out by a tornado between the clouds or between the cloud and the ground. Therefore, an electrostatic force induced between the ground and the thunderstorm cloud may play a major role in the initial formation stage according to a momentum relationship by Formula 1.

3. Tornado as a Location-Specific Phenomena
Tornadoes do not occur randomly and seem to be location-specific phenomena. This fact may be easily seen by the nature ofrepeated generation of tornadoes out of same spots. Such a probability study of tornado multiple-generating spots may well lead a conclusion that tornado formation is not a random occurring phenomenon, but a location-specific phenomenon suggesting probable geology-induced phenomena.

4. Chemical and Electrical Features Induced in Subterranean Oil/Gas Strata as a Fuel Cell
Texas is the richest state in terms of tornado occurrences in the United States. The state had recorded 4472 tornadoes during the years between 1950 and 1988. However, the frequency of tornado occurrences is geographically not evenly distributed throughout the state. Among 254 counties in Texas, there are about 40 counties which had recorded more than 30 tornado-generating incidents during the period. Those counties are precisely matched to major petroleum-producing structural regions in Texas in the last century as reported by N. Tyler et. al.3. The petroleum deposits are in a steady state of leakage or seepage from its petroleum-containing envelope into underground strata. The seeped hydrocarbons in a vapor or liquid phase tend to be oxidized by oxygen from the atmosphere to diffuse through the subterranean zone towards the deposits4 to give a redox cell or a gigantic fuel cell5,6,7, represented in Fig. 3 and subterranean heat generation8.

5. Statistic Conformation between Tornado occurrence and Oil/Gas Deposits
A by-state correlation of oil/gas reserves and frequency of tornado occurrence is provided from petroleum-producing South and Midwest states in Fig. 4 to give a tendency that the more petroleum deposits is in states, the higher tornado frequency is. Also, a county level correlation of the tornado frequency and the petroleum deposits in a typical petroleum-producing state indicates that natural gas fields tend to produce more tornadoes than oil fields do.

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$$\rho \frac{D\mathbf{v}}{Dt} = - \nabla p - [\nabla \tau] + \rho \mathbf{g} - \rho \Omega \mathbf{v} - \rho q \nabla \Phi$$